

Electrical Engineering

Sr. No.	Course Code	Courses	L	T	P	Credits
1	EE3BS03	Engineering Mathematics-III	3	1	0	4
2	EE3CO02	Power Electronics Devices & Circuits	4	0	2	5
3	EE3CO04	Electrical Machines-I	4	0	2	5
4	EE3CO06	Signal & Systems	3	0	0	3
5	EE3CO08	Microprocessors & Microcontrollers	3	0	2	4
6	EN3MC04	Human Values & Ethics	3	0	0	0
7	EN3HS04	Fundamentals of Management, Economics and Accountancy	3	0	0	3
		Total	21	3	6	24
		Total Contact Hours	30			

Electrical & Electronics Engineering

Sr. No.	Course Code	Courses	L	T	P	Credits
1	EX3BS03	Engineering Mathematics-III	3	1	0	4
2	EX3CO02	Power Electronics Devices & Circuits	4	0	2	5
3	EX3CO04	Electrical Machines-I	4	0	2	5
4	EX3CO06	Signal & Systems	3	0	0	3
5	EX3CO08	Microprocessors & Microcontrollers	3	0	2	4
6	EN3MC04	Human Values & Ethics	3	0	0	0
7	EN3HS04	Fundamentals of Management, Economics and Accountancy	3	0	0	3
			21	3	6	24
		Total Contact Hours	30			

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Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EE3BS03/EX3BS03	Engineering Mathematics-III	3	1	0	4

UNIT I GRAPH THEORY-I

Basic definitions of Graphs, Isomorphism, Walk, Path, Circuit, connectivity of a graph, cut points, cycles, Hamiltonian graphs, sub graphs, spanning sub graphs, isomorphic graphs, Digraphs(basic definitions of digraphs), Matrix Representation of Graphs (Adjacency, Incidence Matrices and Circuit Matrix).

UNIT II GRAPH THEORY-II

Weighted graph, Shortest Path in a weighted graph: Dijkstra's Algorithm, Tree, Properties of Tree, Binary Tree, Fundamental Circuit, Minimal Spanning Tree: Kruskal's Algorithm, Prim's Algorithm, Ford-Fulkerson Algorithm for Maximum Flow; Max Flow – Min Cut Theorem. Cut Set, Fundamental Cut Set and Cut Vertices, Application of graphs in network flows.

UNIT III SPECIAL FUNCTIONS:

Series solutions ordinary differential equations, Solution of Bessel and Legendre differential equation, Bessel functions, Legendre functions, recurrence relations, orthogonality properties, Ber and Bei functions.

UNIT IV FUNCTIONS OF RANDOM VARIABLE:

Expectation, Variance, Moments, Characteristic functions Problems, joint moments, joint characteristic functions, conditional distributions, conditional expected values, Random Process concept, Stationarity and independence. Distribution and density of a sum of random variables, Central limit theorem. The random process concept, Stationarity and independence, ergodicity.

UNIT V STATISTICS

Correlation, Karl Pearson's Coefficient of Correlation, Spearman's Rank Correlation Coefficient, Linear Regression, Regression coefficients, Curve fitting (Method of Least Square), Testing of Hypothesis, Student's t-test, Fisher's z-test, Chi-Square test.

Text books:

1. Davenport, "Probability and Random Processes for Scientist and Engineers", McGraw-Hill.
2. Kishor S Trivedi, "Probability and Statistics with Reliability, Queuing and Computer Applications", Prentics Hall of India.
3. Erwin Kreyszig "Advanced Engineering Mathematics", John Wiley and Sons.

Reference books:

1. Hwei P. Hsu, "Theory and Problems of Probability, Random Variables, and Random Processes", Schaum series. TMH.
2. Murray R. Spiegel, "Probability and Statistics", McGrawHill.

3. A. Papoulis and S. Unnikrishna Pillai, "Probability, Random Variables and Stochastic Processes", McGrawHill.

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		L	T	P	Credits
EE3CO02/EX3CO02	Power Electronics Devices & Circuits	4	0	2	5

Unit-I

Thyristors and their characteristics: Introduction to Thyristor family, V-I characteristics of silicon-controlled rectifier (SCR), gate turn-off thyristor (GTO), Bidirectional diode for alternating current (DIAC) and Bidirectional, Triode for Alternating Current (TRIAC), Principle of operation of silicon-controlled rectifier (SCR), Two transistor analogy, Turn on methods of a thyristor, Switching characteristics of thyristors during turn-on and turn-off, Gate characteristics, Turn off methods of a thyristor, Firing circuits of thyristors. Series and parallel operation of silicon-controlled rectifiers (SCR). Thyristor specifications: such as latching current and holding current, critical rate of rise of off-state voltage (dv/dt) and critical rate of rise of on-state current (di/dt) etc., Protection of SCR from over voltage and over current, Snubber circuits.

Unit-II

Phase controlled rectifier: Principle of phase control, Operation and analysis of single phase (Half wave & Full Wave) and multiphase (Three Phase) controlled rectifier circuit with resistive, resistive & inductive load (continuous & non continuous conduction) and RLE loads. Estimation of average load voltage and load current for above rectifier circuits active and reactive power input. Effect of freewheeling diode and source inductance on performance of these rectifier circuits. Comparison of mid point & Bridge rectifier circuits.

Unit-III

Inverters: Single phase Voltage source, Forced-commutated thyristor inverter, three phase bridge inverter, PWM inverter, single phase and three phase CSI, series and Parallel inverter.

Unit-IV

Principle of chopper operation, various control strategies in chopper, Step up & step-up/step down choppers, chopper configuration (Type A, B, C, D, & E), Steady state analysis of chopper circuits, Current, voltage & load commutated of chopper circuits.

Unit-V

Principle of On-Off and phase controls Single phase ac voltage controller with resistive and inductive loads. Three phase ac voltage controllers. Basic principle of operation of cyclo-converter, single phase to single phase cyclo-converter, three phase to single phase and three phase to three phase cyclo-converters.

Text-Books:

1. M.H. Rashid, Power Electronics Circuits, Devices and Applications, Pearson Education.
2. M Ramsmoorthy, An Introduction to transistor and their application, Affiliated East-West Press.
3. P.S. Bhimbhra, Power Electronics, Khanna Publication.

Reference books:-

1. V.R. Moorthy, "Power Electronics: Devices, Circuits and Industrial Applications" Oxford University Press.
2. Ned Mohan, T.M.Undeland and W.P.Robbins, "Power Electronics: Converters, Applications and Design", Wiley India Ltd,
3. P.C. Sen, Power Electronics, TMH.

List of Practical:-

1. To Plot V-I characteristics of IGBT & MOSFET.
2. To draw wave shape of the electrical signal at input and output points of the half wave, full wave and bridge rectifiers.
3. To Plot input /output characteristics of SCR.
4. To construct the R, RC &UJT triggering circuit for SCR and plot its output waveforms.
5. Single phase half controlled converter using R and RL load using MATLAB.
6. To construct Step up MOSFET based choppers and to draw its output response.
7. To study the operation of single phase Cycloconverter using MATLAB/Simulink
8. To study the operations and the performance of the three phase fully controlled converter with resistive and inductive load using
9. To study the behavior of IGBT based single-phase full-bridge inverter connected to R load using MATLAB/Simulink.
10. To study class-A chopper.



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		L	T	P	Credits
EE3CO04/EX3CO04	Electrical Machines-I	4	0	2	5

Unit I

Principles of Electro-mechanical Energy Conversion: Introduction, Flow of Energy in Electromechanical Devices, Energy in magnetic systems (defining energy & Co-energy), Singly excited systems; Determination of mechanical force, Mechanical energy, Torque equation, Doubly excited Systems; Energy stored in magnetic field, Electromagnetic torque, Generated emf in machines; Torque in machines with cylindrical air gap.

Unit-II

Single Phase Transformers: working principle, construction of single phase transformer, emf equation, phasor diagrams on no-load and on loaded conditions, open circuit and short circuit tests, equivalent circuit parameters estimation, voltage regulation and efficiency, back to back test. Effect of saturation on exciting current and in-rush current phenomenon. Parallel operation of single phase transformers.

Unit III

Three phase transformer: its construction, groups and connections, their working and applications; Scott connection; Parallel operation of Transformers: application, advantages, requirement and load sharing; Tap changers, cooling, conservator and breather. Pulse and high frequency transformers.

Unit-IV

Three phase Induction Motor- I: Working principle, construction, comparison of slip ring and squirrel cage motors, steady state analysis, phasor diagram and equivalent circuit, power flow diagram, torque-speed and power-speed characteristics, Losses and efficiency, No load and block rotor test, circle diagram

Unit V

Three phase Induction Motor-II: Motor-Starting of squirrel cage and slip ring motors, power factor control, Cogging & Crawling, Double cage & Deep bar Induction Motor, impact of unbalanced supply and harmonics on performance, speed control, braking, Induction Generator. Applications.

Text-Books

1. I.J. Nagrath and D.P. Kothari, "Electrical Machines", Tata McGraw Hill
2. Ashfaq Husain, "Electrical Machines", Dhanpat Rai & Sons
3. P. S. Bimbhra, "Electrical Machinery", Khanna Publication.



Reference Book:

1. Stephen J Chapman, "Electric Machinery Fundamentals", McGraw-Hill.
2. Gerling Dieter, "Electrical Machines", Springer.
3. M. G. Say, "The Performance and Design of AC machines", Pit man & Sons.

List of Practicals (expandable):

1. Perform turn ratio and polarity test on 1-phase transformer
2. Perform OC and SC tests on a 1-phase transformer and determine its equivalent circuit.
Also calculate efficiency and regulation at different load and power factor.
3. Study various types of starters used for 3-phase IMs.
4. Perform turn ratio and polarity test on 3-phase transformer
5. Perform OC and SC tests on a 3-phase transformer and determine its equivalent circuit.
6. Perform No-load and block rotor test on a 3-phase IM and determine its equivalent circuit.
7. Perform load test on a 3-phase IM and plot its performance characteristics.
8. To realize three phase to two phase conversion using Scott connection of transformer.
9. To perform back to back (Sumpner's) test.



Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EE3CO06/EX3CO06	Signal & Systems	3	0	0	3

Unit I Signals:- Basic definition of signals, Classification of Signals, Signal operations & properties, Analogy between Vectors and Signals, Orthogonal Signals, Signal approximation using Orthogonal functions, Mean Square Error, Closed or complete set of Orthogonal functions, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function.

Unit II Analysis of signals: - Fourier Series Analysis of CT signals, Fourier Transform, properties of Fourier Transform, Laplace transform in signal analysis, Sampling of CT signals & aliasing.

Fundamental difference between Continuous and Discrete time signals, Discrete time signal representation using Complex exponential and Sinusoidal components, Periodicity of Discrete time signal using complex exponential signal. Discrete Fourier series and its properties, DTFT and its properties.

Unit III Systems: - Basic of systems, system properties: Linearity, Static and dynamic, stability and causality, time invariant and variant system, invertible and non-invertible, representation of continuous systems. Continuous Time LTI System:- Differential Equation, Block Diagram representation, Impulse response and convolution integral, properties of convolution, signal responses to Continuous LTI system,

Unit IV Discrete Time System: - Introduction, Properties of discrete time systems, Impulse response characterization and convolution sum, Properties of convolution sum, Discrete systems described by difference equation, solution of difference equation, Impulse response of DT-LTI system.

Unit V Z-Transform:- Concept of Z- Transform of a Discrete Sequence, Two sided and single sided Z- transform, Region of Convergence in Z-Transform, Constraints on ROC for various classes of signals, Inverse Z-transform, Properties of Z-transforms. Solution of difference equation using Z-transform, Relationship between Z-transform and DTFT, Relation between Z-transform and Laplace Transform. Block Diagram representation (Different Forms).

Text Books:

1. Alan V. Oppenheim, Alan S. Willsky and Nawab, Signal & system, Pearson Education.
2. Simon Haykin and Bary Van Veen, Signal & System, Wiley-India Publications.
3. H P Hsu, Rakesh Ranjan, Signal and System, Schaum's Outlines, Tata McGraw Hill.

References:

1. Michel J. Robert, "Fundamentals of Signals and Systems" MGH International Edition.
2. B.P. Lathi, "Linear Signal & System", Oxford University Press
3. Anand Kumar, "Signal & System", PHI Learning.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EE3CO08/EX3CO08	Microprocessors & Microcontrollers	3	0	2	4

Unit-I

Basics of Microprocessor System-Evolution of microprocessor, internal architecture and pin diagram of 8085 microprocessor, operations of microprocessor, address de-multiplexing in microprocessor, addressing modes, memory and concept of memory/IO device interfacing, timing diagram of memory read, memory write cycle, definitions of Machine cycle, instruction cycle and T state.

Unit-II

8086 Microprocessor-Internal architecture and pin diagram of 8086 microprocessor, segmentation of memory, minimum mode and maximum mode operation, addressing modes and instruction set of 8086, assembler directives, assembly language programming, and interrupt of 8086.

Unit-III

Interfacing of Devices With 8086- Memory interfacing, interfacing of 8255 PPI, 8253/54 Programmable Counter/ Timer, 8257 DMA controller, USART 8251 and 8259A Programmable Interrupt controller.

Unit-IV

8051 Microcontroller -Difference between microcontroller and microprocessor, internal architecture and pin diagram of 8051 microcontroller, memory organization, Timer/counter and interrupt, addressing modes, instruction set of 8051, and applications of microcontroller.

Unit-V

High End Processors & Microcontroller-Concepts of RISC & CISC, Von Neumann and Harvard Architecture, Salient features of microprocessors 80286, 80386, 80486, and Pentium, Introduction to ARM processors (ARM 7,9,11), ARM Programmer's Model.

Text Books:

1. R.S. Goankar, "Microprocessor Architecture, Programming and Applications with the 8085", Penram International Publishing.
2. A.K. Ray and K. M. Bhurchandi, "Advanced Microprocessors and Peripherals- Architecture, Programming and Interfacing", Tata McGraw-Hill
3. Muhammad Ali Mazidi and Janice Gillespie Mazidi, "The 8051 Microcontroller and Embedded System", Pearson Education.

Reference Books

1. Hall Douglas V. "Microprocessor and Interfacing", McGraw-Hill Education (India) Pvt Limited.
2. Kenneth J. Ayala, "The 8051 Microcontroller Architecture the III Edition"- Cengage Learning.

3. James L. Antonakos , "The Intel Family of Microprocessors: Hardware and Software Principles and Applications", Cengage Learning.

List of Practicals :

1. Introduction to IDE and Assembler directives.
2. 8051 Assembly language programming for addition, subtraction, multiplication and division of two 8-bit numbers .
3. 8051 Assembly language programming for block data transfer between internal and external memory including overlapping blocks.
4. 8051 Assembly language programming using Arithmetic instructions
5. 8051 Assembly language programming using Logical Instructions
6. 8051 Assembly language programming for code conversions
7. 8051 Assembly language programming for Timers in different modes.
8. I/O port programming in embedded C.
9. Timers and Counters programming in embedded C for time delay and frequency measurement using ISRs.
10. Digital clock programming using 7- segment display in embedded C.
11. Programming of LCD in embedded C.
12. Programming of keyboard in embedded C.
13. Serial communication and UART programming in Embedded C.
14. Programming of parallel ADC and DAC in embedded C.
15. Interfacing Stepper Motor.
16. Speed Control of DC motor using PWM Technique and Microcontroller
17. Designing of SCR firing Circuit for D. C. Converter using Microcontroller
18. Interfacing Relay and opto isolators using Microcontroller



Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EN3HS04	Fundamentals of Management, Economics and Accountancy	3	0	0	3

Unit I: Concepts of Management

Definition, characteristics and importance of management; Management: Science or Art, Difference between Management and Administration, Levels of management, Functions of Management, Managerial Roles, Managerial skills and competencies; Decision Making: Definition, process and types; Decision making under certainty, uncertainty and risk; Cross cultural issues in management and challenges.

Unit II: Fundamentals of Marketing and Human Resource Management

Introduction to Marketing: Definition, importance, function and scope of marketing, Core concepts of marketing, Marketing concepts and orientations, Marketing environment, Marketing-mix, Holistic marketing concept, Customer Relationship Management (CRM).

Introduction to Human Resource Management (HRM): Nature, Scope, Objectives and Functions; Role of HR manager, Process and need for Human Resource Planning, Human resource policies, Changing role of Human Resource in India, Globalization and its impact on Human Resource.

Unit III: Fundamentals of Economics

Introduction to Economics: Definition, nature, scope and significance; Difference between micro and macro economics; Time value of money, Law of diminishing marginal utility; Theory of Demand and Supply, Price elasticity of demand; Meaning and types of costs, Law of variable proportions; Types of market structure; National income and related aggregates; Meaning and types of Inflation; Meaning and phases of business cycle.

Unit IV: Basic Accounting Principles

Accounting Principles and Procedure, Double entry system, Journal, Ledger, Trail Balance, Cash Book; Preparation of Trading, Profit and Loss Account; Balance sheet; Cost Accounting: Introduction, Classification of costs, Methods and Techniques of costing, Cost sheet and preparation of cost sheet; Breakeven Analysis: Meaning and its application.

Unit V: Fundamentals of Financial Management

Introduction of Business Finance: Meaning, Definition of Financial Management, Goals of Financial Management (Profit Maximization and Wealth Maximization), Modern approaches to Financial Management – (Investment Decision, Financing Decision and Dividend Policy Decisions).

Text Books

1. R. D. Agarwal, "Organization and Management", McGraw Hill Education.
2. P. C. Tripathy and P. N. Reddy, "Fundamentals of Management, Economics and Accountancy", Tata McGraw Hill

3. Kotler Philip and Keller Kevin Lane, "Marketing Management", Pearson

Reference Books

1. Peter F Drucker, "The Practice of Management", McGraw Hill
2. Harold Koontz, "Essentials for Management", Tata McGraw Hill
3. M Y Khan and P K Jain, "Management Accounting", Tata McGraw Hill

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